

Emergency Surgery in Colorectal Cancer: Experience of a County Hospital at a 10-Year Interval. Comparison of Immediate Postoperative Results

M. Leșe¹, A. Szasz¹, I. Leșe²

¹Emergency County Hospital Baia Mare, Romania

²Iuliu Hațieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

Rezumat

Chirurgia cancerului colo-rectal în urgență: experiența unui spital județean într-un interval de 10 ani. Compararea rezultatelor postoperatorii imediate

O mare parte dintre operațiile pentru cancerul colo-rectal se fac în urgență și sunt grevate de mortalitate și morbiditate postoperatorie semnificativă. Scopul studiului este să compare rezultatele postoperatorii imediate ale operațiilor efectuate în urgență pentru cancer colo-rectal la interval de 10 ani într-un spital județean de urgență. Au fost studiate retrospectiv fișele de observație ale celor 24 de pacienți operați în urgență în anul 2001 și ale celor 22 de pacienți cu operații de urgență în 2011 urmărindu-se datele demografice, complicația pentru care s-a impus intervenția chirurgicală, intervalul de timp de la debut până la operație, tipul operației, morbiditatea și mortalitatea postoperatorie. În anul 2001 s-a înregistrat postoperator o morbiditate de 66,66% (16 pacienți) și o mortalitate de 41,66% (10 pacienți), în timp ce în anul 2011 acestea au fost de 54,54% (12 pacienți) și respectiv 36,36% (8 pacienți).

Concluzie: deși morbiditatea și mortalitatea postoperatorie au scăzut la interval de 10 ani, ele se mențin încă la valori ridicate, iar diferența nu este semnificativă statistic ($p = 0,21$ și respectiv $0,40$).

Cuvinte cheie: cancer colorectal, urgență, morbiditate, mortalitate

Abstract

A great majority of procedures for colorectal cancer are performed as emergencies, implying a high morbidity and mortality. The aim of this study is to compare the immediate postoperative results of emergency procedures for colorectal cancer between a 10 year interval in a single centre. We performed a retrospective research of the patients' files, totaling 24 emergency operations in 2001 and 22 emergency operations in 2011. We followed demographic data, the complication which lead to emergency surgery, the time interval between the onset of the complication and the time of surgery, the type of procedure performed, postoperative morbidity and mortality. In 2001 we noticed morbidity in 66.66% of the cases (16 patients) and a mortality of 41.66% (10 patients), while in 2011 the postoperative morbidity was 54.54% (12 patients) and a mortality of 36.36% (8 patients). Conclusion: although both morbidity and mortality rates decreased in a 10 year interval, they still present high values, and the difference is not statistically significant ($p = 0.21$ and 0.40).

Key words: colorectal cancer, emergency, morbidity, mortality

Introduction

More than one million new cases of colorectal cancer and almost 500,000 fatalities due to colorectal cancer are reported every year worldwide (1). In 2008 colorectal cancer was reported as being the second most common malignancy in males and the third malignancy in females (2). In Romania, during the same year, the incidence and mortality due to

Corresponding author:

Mihaela Leșe, MD
11/43 Decebal Blvd, Baia Mare, 430021
Maramureș, Romania
E-mail: mihaelalese@yahoo.co.uk

colonic and rectal cancer was 33.5 and 19.2 in 100,000 (3), being almost three times higher than the values recorded in 1989, when incidence was 10.1 and mortality was 11.38 in 100,000 inhabitants. In Maramures county, with a population of 461,290 inhabitants in 2011, the National Cancer Registry recorded 160 new cases and 111 deaths in 2011 due to colonic and rectal cancer, which means an incidence of 34.68/100,000 inhabitants and a mortality of 24.06/100,000 inhabitants, values which are higher than the national average. While the higher incidence can be attributed to the western lifestyle (obesity, lack of physical exercise, diet including large quantities of meat and not enough fruit and vegetables, smoking, alcohol consumption etc.), the increased mortality is due to the lack of a screening program and a poor education of the general population, resulting in a high rate of complication of the disease which lead to diagnosis in emergency. Because the complications of colorectal cancer benefit mainly of surgical treatment, the aim of this study is to compare the immediate postoperative results obtained at an interval of 10 years, 2001 and 2011, in a single centre, Emergency County Hospital Baia Mare. A statistical analysis was performed.

Material and Method

We performed a retrospective observational study of the patients admitted in emergency for complications of colorectal cancer in two separate years, at a ten year interval: 2001 and 2011. We based our study on the recordings found in the operative protocols and on the patients' files, correlated with the regional data of the National Cancer Registry. We divided the patients into two groups: the first one, who underwent surgery between January and December 2001 and the second one consisting of those who underwent surgery between January and December 2011. Inclusion criteria were: admittance into hospital for a complication of colorectal cancer and postoperative histopathological confirmation of the colorectal cancer. We excluded from this study the patients with prior diagnosis of colonic or rectal cancer and the patients with recurrence tumors. We analysed three categories of data: demographic data, data regarding the main disease and associated comorbidities of the patients and data regarding the postoperative outcome. Demography recorded age, gender and urban or rural provenience of the patients. Diagnosis and

comorbidities data included: the complication which lead to admittance, localization of the tumor, time interval from symptom debut to admittance and from admittance to operation, intraoperative TNM staging, type of surgery and biological parameters at admittance, such as: heart rate, blood pressure, diuresis, hematocrit, haemoglobin, white blood cell count and serum urea. Postoperative data followed: duration of hospitalization, postoperative complications and mortality during the first 30 days after surgery. Both in 2001 and 2011 we analysed patients from three young specialists in general surgery and the rest of the surgeons were consultants with a large experience in emergency digestive surgery.

This retrospective study was performed without holding any patient's identification data, no questionnaire was provided and therefore no informed consent from the patient was needed.

Statistical analysis

Continuous variables were presented in median and range, mean value and standard deviation. For this data, the comparison was made using T-test, Kruskal-Wallis test and Mann-Whitney test. Comparison of the nonmetric variables was performed using chi-square test and Fisher's exact test. The type and number of postoperative complications were compared with average values of different variables. P values of less than 0.05 were considered statistically significant. The statistical analysis was performed using SPSS 14.0 (SPSS Inc., Chicago, IL, USA).

Results

A total of 69 patients underwent surgery for colonic and rectal cancer in 2001 and a total of 71 in 2011. In 2001, emergency procedures were performed in 24 cases (34.78%) and in 2011 emergency procedures were performed in 22 cases (30.99%) (Table 1). We have included in our study only patients with emergency operations.

Demographic data, complication which lead to admission and surgery and localization of the tumor

Patient's age, gender and provenience showed no statistically

Table 1. Operations performed for colonic and rectal cancer in 2001 and 2011

		2001 (N = 69)		2011 (N = 71)		P*
		N (%)		N (%)		
Scheduled surgery	Colonic	26	37.68	31	43.66	0.48
	Rectal	19	27.53	18	25.35	0.59
Emergency surgery	Colonic	16	23.18	15	21.12	0.59
	Rectal	8	11.59	7	9.85	0.59
Total emergencies		24	34.78	22	30.98	0.99
Total scheduled		45	65.21	49	69.01	0.59
Total patients		69	71			

*Chi-square test

Table 2. Demographic data and the complication which lead to emergency surgery in 2001 and 2011

		2001 (N = 24)	2011 (N = 22)	P*
Age (average $\pm$ standard deviation)		66.54 $\pm$ 15.54	68.73 $\pm$ 12.03	0.59*
Gender	Male	8	13	0.1*
	Female	16	9	
Provenience	Urban	12	12	0.9*
	Rural	12	10	
Complication which lead to surgery	Obstruction	16	15	0.98**
	Perforation	5	6	
	Bleeding	3	1	

* Chi-square test, **Fisher exact test

significant difference in 2001 compared to 2011 (Table 2). The repartition on groups of age (Fig. 1) and localization of the tumor (Fig. 2) also didn't show a statistically significant difference between the two groups of patients studied. Most of the patients were in their 8th decade of life, both in 2001 (12 patients, representing 50% of the total number of patients included in this study) and in 2011 (8 patients, representing 36.36%) (Fig. 1). The most common localization of the tumor was the sigmoid colon and rectum, totalizing a number of 15 cases (62.5%) in 2001 and 18 cases (81.81%) in 2011 ($p=0.74$).

Data on the preoperative period, biological status and comorbidities

The period between admission and surgery and the biological parameters showed no statistically significant difference between 2001 and 2011. High blood pressure is the only comorbidity which has registered large differences between the two groups: 5 cases in 2011 ($p=0.02$) (Table 3).

Cancer staging, postoperative complications, duration of hospital stay and postoperative mortality

TNM staging didn't show any statistically significant differences between the two groups studied regarding metastasis

($p=1$), metastatic lymph nodes ($p=0.489$) or tumor size ($p=0.2$); No statistically significant differences were noticed regarding minor postoperative complications (wound infection, wound dehiscence, acute pyelonephritis – 7 cases in 2001 and 6 cases in 2011), major postoperative complications (toxic shock, pulmonary embolism, myocardial infarction, pneumonia, postoperative bowel obstruction – 10 cases in 2001 and 6 cases in 2011) – $p=0.092$, hospital stay ($p=0.263$) or postoperative mortality (10 cases in 2001 and 8 cases in 2011, $p=0.9$) (Table 4).

Relations between postoperative mortality and several variables

The survival rate was statistically significantly influenced by heart rate at admission (average heart rate of 84/min among the patients who had a favorable outcome – $p=0.005$), blood pressure (average of 129.82 mmHg blood pressure correlated with survival – $p=0.039$), level of blood urea, (average of normal value - 38.85 mg/dl - being correlated with survival – $p=0.002$), age (average of 62.75 years correlated with a favorable outcome at 30 days after surgery – $p=0.001$), rural

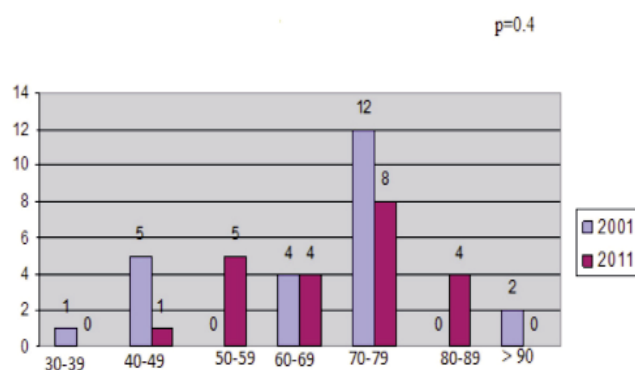
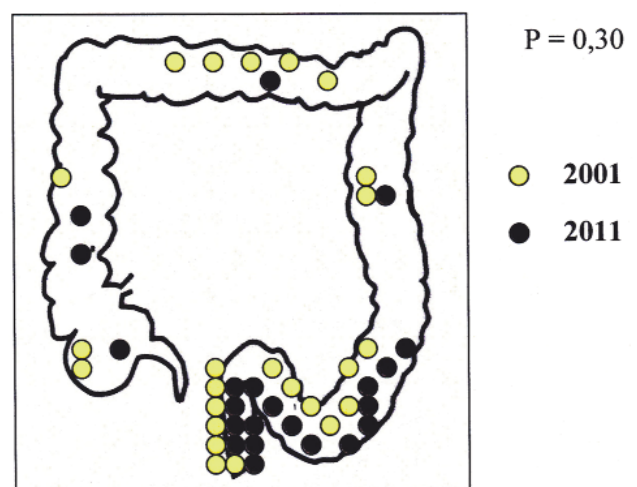
**Figure 1.** Repartition of the patients on groups of age**Figure 2.** Localization of the tumor

Table 3. Data on the preoperative period, biological status and comorbidities of the patients operated for complicated colorectal cancer in 2001 and 2011

	2001 (N = 24)	2011 (N = 22)	P
Time period between onset of symptoms and admission - hours (average $\pm$ standard deviation)	66.54 $\pm$ 29.57	75.68 $\pm$ 25.25	0.175*
Time period between admission to surgery - days (average $\pm$ standard deviation)	3.92 $\pm$ 3.84	2.23 $\pm$ 2.52	0.083*
Blood pressure - mmHg (average $\pm$ standard deviation)	120.42 $\pm$ 28.39	126.59 $\pm$ 24.94	0.439**
Diuresis - ml (average $\pm$ standard deviation)	1041.67 $\pm$ 663.92	1150 $\pm$ 549.24	0.552**
Hematocrit - % (average $\pm$ standard deviation)	33.87 $\pm$ 6.78	38.49 $\pm$ 8.54	0.052**
White blood cells - no/ml (average $\pm$ standard deviation)	7245.83 $\pm$ 3397.95	9414.55 $\pm$ 3932.11	0.051**
Elevated heart rate ($\geq$ 100/min)	5	5	0.6**
Elevated blood level of urea ($\geq$ 40 mg%)	12	15	0.5**
Associated pulmonary disease	2	2	0.8***
Associated ischemic cardiomyopathy	6	5	0.2***
Associated cardiac failure	4	1	0.3***
Associated atrial fibrillation	4	1	0.3***
Associated high blood pressure	0	5	0.02***

* Kruskal-Wallis test, **Mann-Whitney test, *** Chi-square test

Table 4. Cancer staging, postoperative complications, duration of hospital stay and postoperative mortality

		2001 (N = 24)	2011 (N = 22)	P
Tumor	T2	1	0	0.2*
	T3	12	15	
	T4	11	7	
Lymph nodes	N0	6	4	0.489*
	N1	8	11	
	N2	10	7	
Metastasis	Hepatic	4	4	1*
	Peritoneal	3	1	
	Pulmonary	0	2	
Postoperative morbidity	Minor complications	7	6	0.092*
	Major complications	10	6	
Hospital stay - days (average $\pm$ standard deviation)		14.83 $\pm$ 7.54	12.68 $\pm$ 4.93	0.263**
Postoperative mortality (first 30 days)		10	8	0.9*

* Fischer test, **T-test

Table 5. Correlation between postoperative mortality and several variables (N = 46)

Variable		Number of patients who died (N = 18)	Number of patients who survived (N = 28)	P
Heart rate (/min)	median	90	84	0.005*
Blood pressure (mmHg)	average	113.33	129.82	0.039*
Urea (mg/dl)	median	69	38.85	0.002*
Age (years)	average	75.11	62.75	0.001*
Provenience	urban	5	19	0.01**
	rural	13	9	
Hospital stay (days)	average	10.44	15.96	0.003*

*Chi-square test, **Mann-Whitney test,

Table 6. Table 6. Correlation between postoperative complication and several variables (N = 46)

Variable studied	Postoperative complication			P
	none	minor	major	
Average age (years)	62.6	64.6	74.6	0.02*
Deaths	1	2	15	<0.001**
Hospital stay (days)	12.9	21	10	<0.001*
Provenience				
Urban	12	8	4	0.01**
Rural	6	3	13	

*T-test. ** Fischer test

provenience (correlated with higher death rate - $p=0.01$) and duration of hospitalization (10.44 vs 15.96 days - $p=0.003$). The statistical analysis has been done on the two reunited groups (Table 5).

Relations between postoperative complication and several variables

The occurrence of major complications was correlated with: advanced age ($p=0.02$), high death rate ($p<0.001$), reduced hospital stay ($p<0.001$) and rural provenience ($p=0.01$) (Table 6).

Mortality, postoperative complications and duration of hospitalization were not influenced neither by the complication of colorectal cancer which lead to surgery ($p>0.1$) nor by the surgical procedure performed (resection with anastomosis, resection with colostomy, $p>0.49$).

The correlations were done also on the two reunited groups.

Discussions

This study presents the results of the surgical procedures performed for complicated colon and rectal cancer in the Emergency County Hospital Baia Mare at an interval of ten years, in 2001 and 2011. Emergency County Hospital Baia Mare covers a population of 461,290 inhabitants in Maramures county (in 2011), 10% less than the inhabitants in 2001, when there were 510,110 people in Maramures county. Emergency procedures for complicated colonic and rectal cancer, although decreasing in number, represented 30.99% in 2001 and 34.78% in 2011 of all colonic and rectal procedures performed. These numbers are in concordance with literature data, which shows a percentage of 6 to 40% emergency procedures out of all colonic and rectal procedures (4,5). Over all, this percentage is still high, being reported mainly in less developed societies (6). The total number of patients who underwent surgery for colorectal cancer is also increasing due to the rising incidence of this pathology in Romania (3).

The two groups of patients included in this study showed no statistical significant difference regarding sex ratio, provenience, complication which lead to surgery, repartition on groups of age and localization of the tumor.

The time interval from symptom onset to admission is a

main factor to influence morbidity and mortality after surgery (7,8), especially regarding emergency procedures because of the limited time to correct and properly treat comorbidities, hydric and metabolic deficiencies (9,10). In our study, this interval was longer than 3 days in 2011, without being significantly longer than in 2001 and not influencing morbidity and mortality in both groups of patients ($p=0.271$ – Kruskal-Wallis test).

Duration of preoperative treatment must accomplish the goal of correcting hydric and metabolic deficiencies without delaying the surgery. Delay of surgery, when noticed, was due to insufficient resources in radiology and endoscopy in order to set the diagnosis. When talking about a perforated tumor with peritonitis, when surgery is immediate and tumoral bowel obstruction present, the diagnosis is simple and without any unnecessary delays, problems occurring in case of covered perforation with vague symptoms (fever, leucocytosis) and in case of tumor hemorrhage, when treatment is often conservative until severe anemia occurs, by this unnecessary delaying the surgery (12,13).

The time interval between admission and surgery decreased in 2011 compared to 2001 and multiple authors state that this time interval has a great influence on mortality (14, 15, 16); we noticed that patients who underwent surgery in the first 3 days after admission had fewer complications ($p=0.005$ - χ^2 test).

Associated pathologies of the patients are considered major risk factors for postoperative mortality and morbidity, especially lung disease (17,18), heart conditions (18,19) and high blood pressure (18,19), these having a great impact on the results of the surgery for colonic and rectal cancer. In our study, the two groups of patients showed no statistically significant difference regarding comorbidities at admission, excepting high blood pressure, which was found in 5 cases in 2011 ($p=0.02$), in accordance with the national and European ascendant trend of this disease, as reported in ECHI-list of indicators/2009 (20). Different from previous reports, we noticed no association between patients' comorbidities and postoperative mortality, not even when it comes to high blood pressure (high blood pressure was encountered in only one case who died in the first 30 days after surgery). This was probably because of the reduced number of patients in this study.

Physiological parameters included in this study (blood pressure, heart rate, diuresis, hematocrit, white blood cells and

urea) didn't show significant difference among the two groups studied. Other variables included in POSSUM scoring system (Glasgow, sodium and potassium level and creatinine), as regulated by Copeland (21) were not studied because we couldn't find reference about them in all cases, these parameters not being recorded in all cases studied.

Among the variables followed, heart rate, high blood pressure and elevated levels of sanguine urea were correlated with a higher rate of postoperative mortality, the same results being found in the studies which regulated the POSSUM, P-POSSUM and Cr-POSSUM scoring systems (22,23). On the other hand, the same parameters are specific to systemic inflammatory response syndrome, which is associated with poor results in emergency surgery (24).

The procedures performed – resection with anastomosis or resection with colostomy – both have pro and cons arguments, and usually the choice is determined by the biological status of the patient (25) or by the possibility to perform endoscopic procedures which can offer enough time before surgery in order to obtain an acceptable biological state prior to surgery (26).

TNM staging was studied by several authors correlated with cancer outcome, but, to our knowledge, immediate postoperative outcome according to TNM staging wasn't an issue of study, especially when it comes to emergency surgery for colorectal cancer. The two groups in our study showed no significant difference in TNM staging, more, TNM staging wasn't associated with postoperative morbidity and mortality.

Patients with major complications after surgery showed an increased mortality, while minor complication after surgery was not associated with a higher mortality, these data being similar to other reports on this issue. On the other hand, we noticed a reduced hospitalization on patients with major complications after surgery, due to the higher mortality of these patients and a prolonged hospitalization for patients with minor complications after surgery even if only two cases of mortality were noticed among the group with minor complications after surgery ($p < 0.001$). Postoperative morbidity differed with the urban or rural provenience of the patients: major postoperative complications occurred more often in patients coming from rural areas and minor complications occurred more often in patients from urban areas ($p = 0.01$), this being most likely due to the delay in address to medical service of the patients from rural areas.

Regarding the experience of the surgeons, no significant differences were noticed in 2001 compared to 2011: both in 2001 and in 2011 our team consisted of 6 consultants and 3 specialists in general surgery, all of them with a great experience in emergency digestive surgery.

Conclusions

Immediate postoperative results regarding morbidity and mortality and duration of hospitalization improved in 2011 compared to 2001, although the data were not statistically significant. The novelty of this study is represented by the analysis of the factors which influence the immediate postoperative outcome, morbidity, mortality and duration of

hospital stay being influenced mainly by the alteration of physiological parameters which characterize inflammation (heart rate, blood pressure, diuresis, blood levels of urea, white blood cells), age and provenience of the patients. Cancer staging, type of surgery performed and associated pathology proved to have a lesser influence on the outcome.

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